2019

Question 1: I'm Stoked!; Question 2: Geckos

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Physics Challenge for Teachers and Students

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Downton Abbey

A vertical light rod of length l is pivoted at its top end. A small sphere of mass m and charge $+q$ is attached to the bottom end of the rod. Another small sphere of charge $-q$ is mounted a distance l directly above the pivot point. After a small disturbance, the rod swings back and forth in the vertical plane. Find the period of that motion.

We received a large number of solutions to our December *Challenge* ***Plane and simple***. We are pleased to recognize the following contributors:

Juan M. Aguirregabiria (University of the Basque Country, Bilbao, Spain)
Vidya Bhushan (Bhilai, India)
Norman Derby (Southwestern Oregon Community College, Brookings, OR)
W.P. Dykshoorn (Bayview Secondary School, Richmond Hill, Canada)
John Mallinckrodt (Cal Poly Pomona, Pomona, CA)
Ramiro Alfredo Moro Morey (UTEC, Lima, Perú)
Carl E. Mungan (U. S. Naval Academy, Annapolis, MD)
Duong Phan (Cumberland Valley High School, Mechanicsburg, PA)
Randall J. Scalise (Southern Methodist University, Dallas, TX)

Guidelines for contributors

- We ask that all solutions, preferably in Word format, be submitted to the dedicated email address ***challenges@aapt.org***. Each message will receive an automatic acknowledgment.
- If your name is—for instance—Jennifer Lawrence, please name the file "***Lawrence19Mar***" (do not include your first initial) when submitting the March 2019 solution.
- The subject line of each message should be the same as the name of the solution file.
- The deadline for submitting the solutions is the last day of the corresponding month.
- Each month, a representative selection of the successful solvers' names will be published in print and on the web.
- If you have a message for the Column Editor, you may contact him at ***korsunbo@post.harvard.edu***; however, please do not send your solutions to this address.

Many thanks to all contributors and we hope to hear from many more of you in the future!

Note: as always, we would very much appreciate reader-contributed original *Challenges.*

Boris Korsunsky, Column Editor

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Fermi Questions

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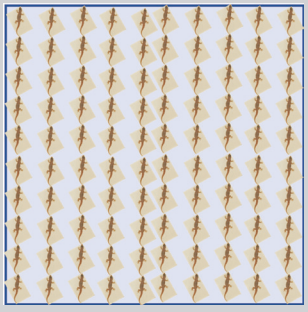
Question 1: I'm stoked!

Old-fashioned steam engines were powered by coal transferred from the tender to the engine by human stokers using a shovel. What is the maximum power such an engine could attain?

Question 2: Geckos

How many geckos would be needed to apply enough force to lift a typical glass window pane? How about a plate-glass window? Assume that we lift the pane by pulling up on all the geckos. *(Thanks to Lucas Tracy of Old Dominion University for suggesting the question.)*



Look for the answers online at *tpt.aapt.org*

Question suggestions are always welcome!

For more Fermi questions and answers, see *Guesstimation 2.0: Solving Today's Problems on the Back of a Napkin,* by Lawrence Weinstein (Princeton University Press, 2012).

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